Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
30 SEP 1999		**00-00-1999 to 00-00-1999**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Sediment Volume Inhomogeneities,Patterns, Mechanisms and Rates of Change	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Oregon State University,College of Oceanic and Atmospheric Sciences,104 Oceanography Admin Bldg,Corvallis,OR,97331**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**2**	

Sediment Volume Inhomogeneities,Patterns, Mechanisms and Rates of Change

Robert A. Wheatcroft
College of Oceanic & Atmospheric Sciences
Oregon State University
Corvallis, OR 97331
phone: (541) 737-3891 fax: (541) 737-2064 e-mail: raw@oce.orst.edu
Grant Number: N00014-98-1-0890

LONG-TERM GOALS

The ultimate objective of this research program is to identify and obtain a predictive understanding of the physical and biological processes responsible for variations in the subsurface bulk density field of marine sediments. To achieve this goal it is necessary to study formative processes occurring on the sediment surface (e.g., biogenic mound formation, ripple development), as well as processes occurring within the seabed (e.g., bioturbation and compaction). The approach to these areas of interest is predominantly field-oriented, with a secondary emphasis on model development.

OBJECTIVES

The objective of this project, which is part of the High-Frequency Sediment Acoustics DRI, is to quantitatively document the patterns of, and processes leading to, sediment volume inhomogeneities at the Fort Walton Beach, FL study site. A secondary objective is to estimate temporal rates of change of the volume inhomogeneity field and bottom roughness.

APPROACH

A two-pronged approach will be taken to accomplish the above objectives. First, a modestly-instrumented bottom tripod will be deployed at the study site during the October-November SAX99 experiment. Time-lapse instrumentation on the tripod will include a stereocamera, pressure sensor and acoustic Doppler velocimeter (ADV). In addition, deliberate-tracer bioturbation experiments will be conducted during the experiment. The purpose of these measurements is to document physical and biological processes leading to the observed sediment volume inhomogeneities.

The second approach will be to quantitatively measure the sediment volume inhomogeneity field using digital radiography and an in situ resistivity profiler. Precisely located and oriented cores will be collected by divers at multiple separation lengths, transported to the ship and immediately radiographed onboard. Brightness data will be transformed to bulk density data, based on empirical laboratory correlations. The bulk density fields will be described and analyzed using a variety of spatial statistical measures (e.g., Tang and Wheatcroft, 2000), as well as classical sedimentological nomenclature. Independent estimates of bulk density profiles will be made using a newly constructed, diver-deployed resistivity profiler.

WORK COMPLETED

Activities during FY 99 were mainly in preparation for the SAX99 field experiment scheduled for October-November 1999. Using funds from a DURIP project, a state-of-the-art digital x-radiography system was developed. The system comprises a constant potential, water-cooled x-ray source (Lorad LPX-160), an amorphous-silicon x-ray detector (dpiX Flashscan 30) and a Windows NT workstation. The active imaging area is 28 by 40 cm at a pixel resolution of 127 micrometers and bit depth of 12. The system was field tested on a STRATAFORM cruise in early August and performed well.

An in situ resistivity profiler (IRP) was designed, constructed and tested during winter –spring 1999. This system comprises a 4-electrode probe, mounted on a lead screw that provides vertical translation. Resistivity is logged at 0.25-mm depth intervals to 15 cm. The unit is deployed by divers, takes ~3 minutes for a profile and can be precisely positioned over features of interest (e.g., mounds, ripple crests, ripple troughs). In field trials in July at the Fort Walton beach study site the system worked well.

RESULTS

The SAX99 field effort is scheduled for October-November 1999. Until then, there are few results to report.

IMPACT/APPLICATIONS

For a range of frequencies, digital radiographs have the greatest potential for providing acousticians with high-quality data on the volume inhomogeneity field. Further development of this research topic has wide-ranging applications.

TRANSITIONS

None are presently known, however, the digital x-radiography system would seem to have potentially wide application in the Fleet.

REFERENCES

Tang, D. and R.A. Wheatcroft. Sediment density inhomogeneity spectra estimated from digital x-radiographs. J. Acoustical Soc. America